

# Capital Metro – Zero Emission Bus Project

Joint Sustainability Committee

October 24, 2018



# Capital Metro Strategic Plan

- **Vision:** Capital Metro is transforming the daily lives of Central Texas by providing a robust, sustainable, transportation network.
- **Goal 5 (Financial and Business) Exhibit good stewardship of public funds.** Use available resources and institute productive and *sustainable business practices* that will ensure resources are used efficiently and effectively.

# Capital Metro Strategic Plan

## Objective

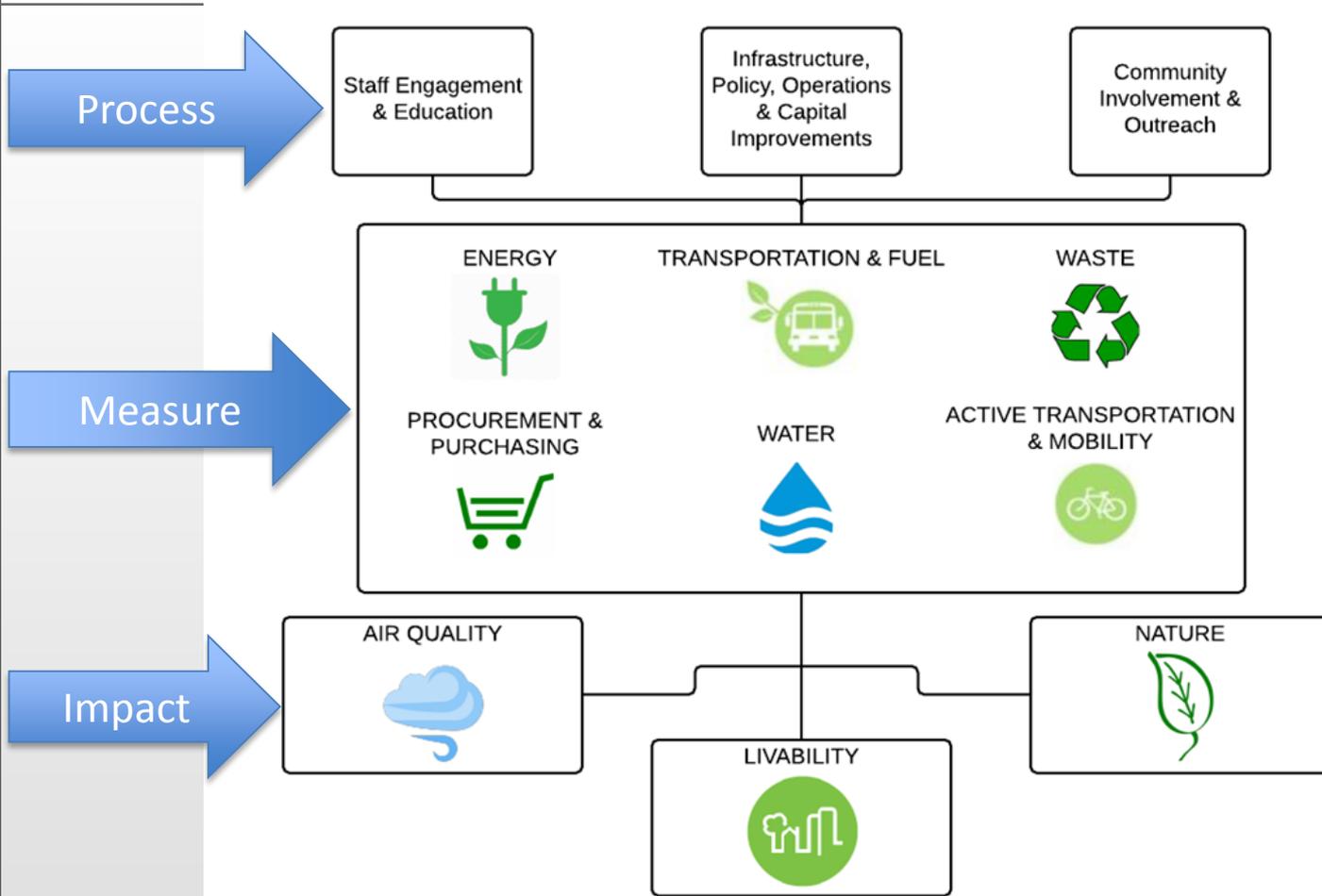
**5.2: Implement sustainability and environmental best practices: *Manage resources to reduce impacts on the environment and operating costs.*** Provide our community with clean and sustainable transit options, complying Transit Asset Mgt. System MAP21 Guidelines

# Environmental and Sustainability Management System (ESMS) and Policy

We all have a responsibility to make good choices for our family, our community and future generations. Realizing that our natural resources are limited, Capital Metro is implementing an Environmental and Sustainability Management System (ESMS) to help reduce our environmental impacts and operate more efficiently. With an ESMS, Capital Metro will:



# CMTA Sustainability Framework



# Zero Emission Buses



**Mission:** To advance clean, sustainable, innovative transportation and energy technologies

- Non-profit, membership-based - founded in 1993
- Portfolio - \$450+ million
  - Research, development, demonstration, and deployment
  - Alternative fuel and advanced vehicle technologies
- Project sponsorship
  - Federal Transit Administration (NFCBP, TIGGER, Clean Fuels, Low No, procurements)
  - Departments of Energy, Defense, Interior, NASA, and EPA
  - State of California – CEC, ARB, BAAQMD, SCAQMD

# Projects

## CTE ACTIVITY MAP

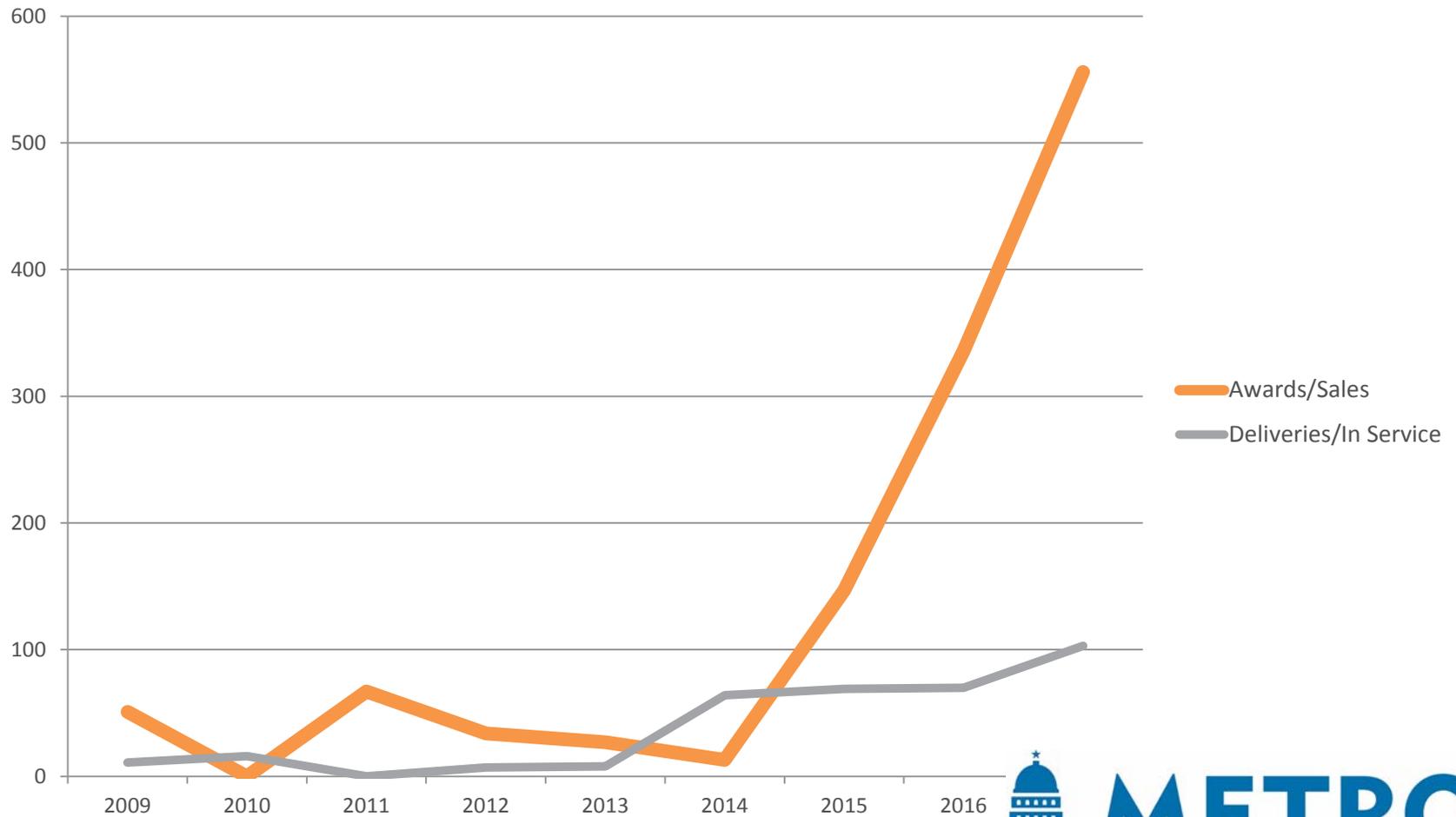


- CURRENT PROJECTS
- PENDING PROJECTS
- MEMBERS
- TRANSIT
- PAST PROJECTS

# Pace of Change

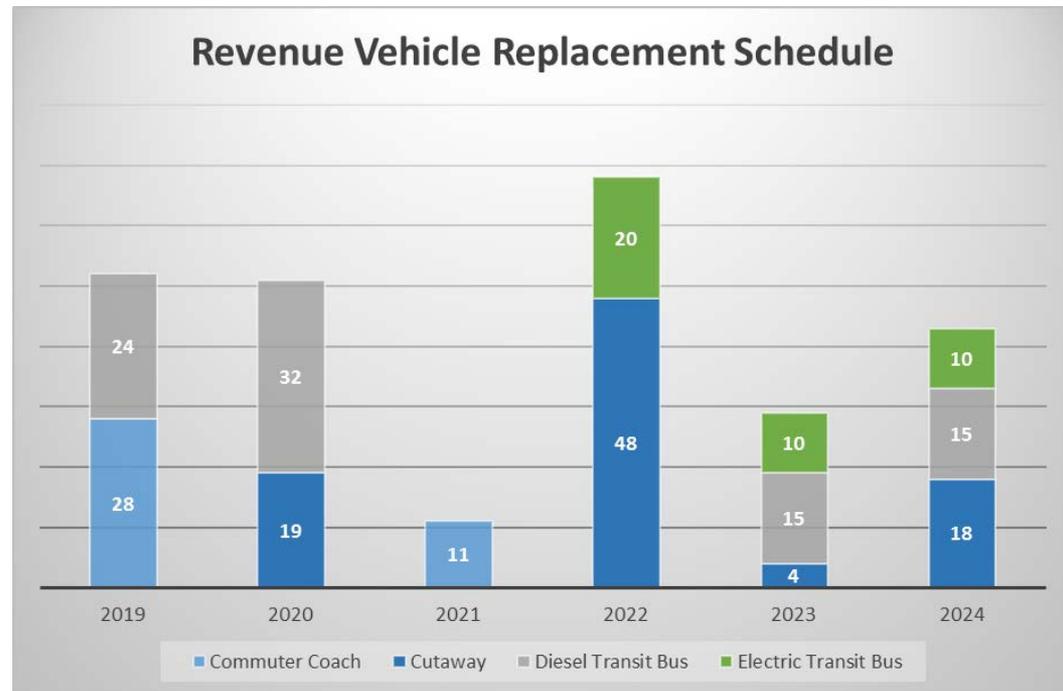


## ZEB U.S. Annual Sales & Deliveries



# Capital Metro ZEB Fleet Plan

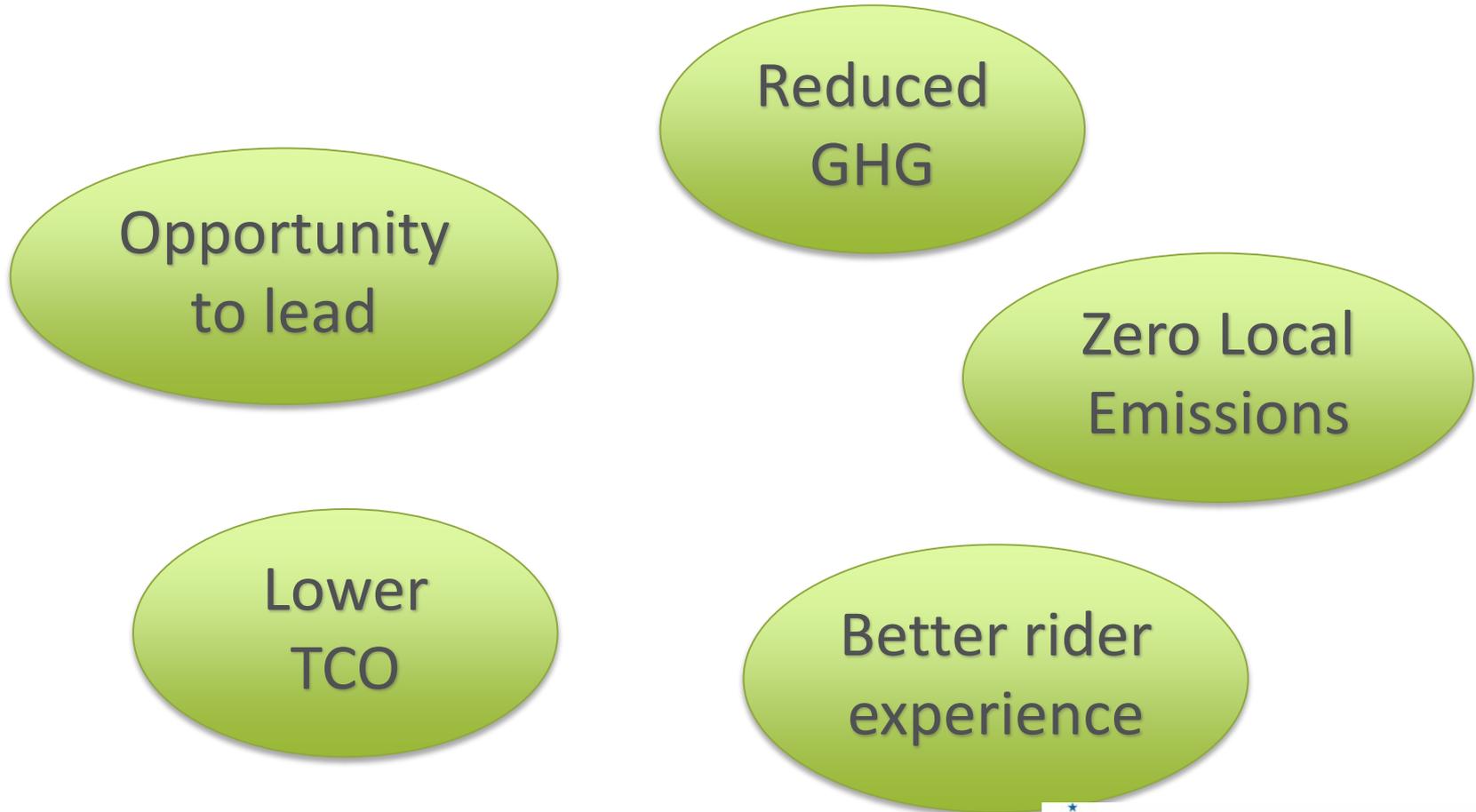
- ZEBRA membership
- Vehicle demonstrations in August/September
- Phase One Implementation Planned
  - 40 buses over 3 year period (FY22 to FY24)
  - Infrastructure is greatest “unknown” at this point
  - Grant funding or other incentives assumed in financial plan



What is “success” for  
Capital Metro’s 2024  
zero emission  
deployment?

# Example Motivations

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# Motivations for Deploying ZEB

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- Why transition to a zero emission fleet?
- Why now?
- What are the critical outcomes?
  
- What is not important?

# Battery Electric Bus Recent History

Calendar Year		Awards & Sales
2009 - 2014		146
2015		136
2016		294
2017		556

Calendar Year	Base Price	Energy Storage
2010	\$1.2 mm	75 kWh
2018	\$750k	450+ kWh



# Main Battery Electric Bus Manufacturers



## BYD

- 35' – 60' transit buses, 23' – 45' motor coaches available
- On-route charging and depot charging available



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# Main Battery Electric Bus Manufacturers



## Gillig

- 40' transit buses available
- Depot charging available



# Main Battery Electric Bus Manufacturers



## New Flyer

- 35', 40' and 60' buses available
- On-route charging and depot charging available



# Main Battery Electric Bus Manufacturers



## Proterra

- 35' and 40' buses available
- On-route charging and depot charging available



# Additional Electric Bus Manufacturers



- CCW
- Novabus
- Ebus
- Greenpower
- MCI (New Flyer)
- Van Hool
- El Dorado

# Battery Electric Bus Advantages

- Available today
- Fully zero emissions
- Fuel available everywhere
- Batteries will continue to get better
- Simplest zero emission vehicle architecture
- Capital and fuel cost can be similar to conventional buses



# Bus Charging Systems

## Depot charging

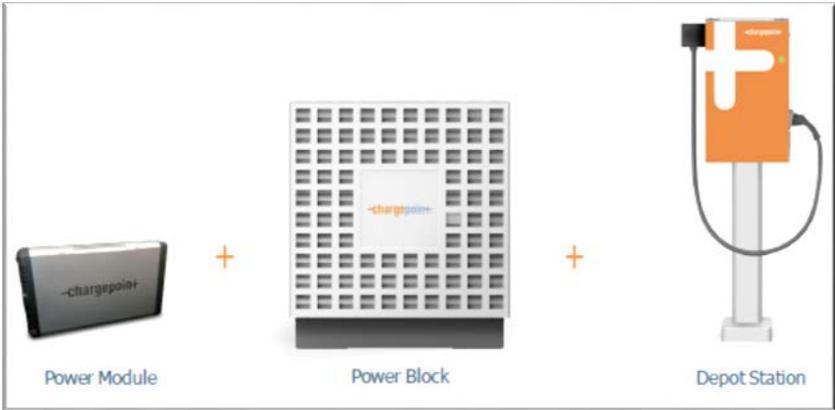
- Standard largely agreed by major OEMs - SAE J1772
- CCS 1 plug most common

## Overhead/On-Route Charging

- Working Group standard - J3105
- Several competing solutions



# Depot Charger Options



# On-Route Charging



# Battery Electric Bus Challenges



- Not a drop in replacement today for diesel buses in large numbers
- Deployments are more complicated than diesel
  - Fuel costs can change based on utility rate schedules
  - Bus range can vary route-to-route and season-to-season
  - User can only access ~75 percent of battery capacity
  - Battery capacity decreases over time
  - Drivers can have a large influence on performance

Deployment decisions will need careful planning

# Large Battery Electric Bus Charging

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- Few large-scale infrastructure plans implemented so far
  - 20 buses charging = 1 - 3 MW grid requirement
  - 200 buses charging = 10 - 30 MW grid requirement

# Unknowns and Potential Challenges

## *Infrastructure for 100's of buses*

PROTERRA  
CHARGING



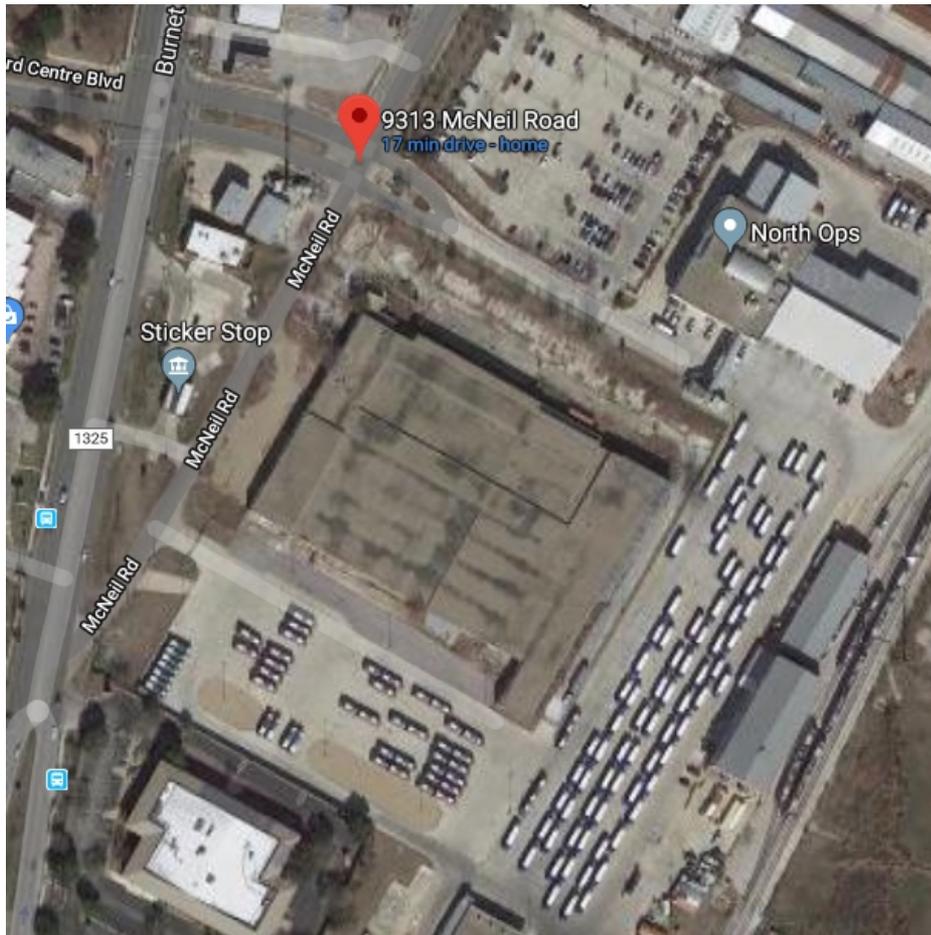
Source: Proterra.com



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# Unknowns and Potential Challenges

## *Long term ZEB fleet size requirements*



- *ZEB impacts*
- *planned growth*

# Unknowns and Potential Challenges

*Long term maintenance costs*



# Unknowns and Potential Challenges

*Technology obsolescence / fast progress*



# Unknowns and Potential Challenges

*Capital and lifecycle cost – Buses and facilities*



# Unknowns and Potential Challenges

## *Training / Human Resources*



## Next Steps

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- Funding and total cost
- Research, peer assistance with ZEB
- Technology decisions
- Analysis needed